Claims

1. Method for connecting plates lying on top of one another, with which stacked plate sections (19, 21, 22) of these plates (15, 16, 17) are deep-drawn together into a deep-drawing opening (9) of the bottom die (8) by a die (1) and its associated bottom die (8) with a actually unyielding base (11) and are afterwards radially squeezed wide transverse to the deep-drawing direction, due to the resistance of the base (11) (Clinching). Hereby at least the bottom part of the first (lowest) plate section (19), seen from the bottom die (8), and the above second and additional plate sections (21, 22) sub-seize their associated plate at least partially, characterized by the fact,

   – that during the deep-drawing and squeezing procedure, due to the shape of the work area (4, 5, 6) of the die (1), the displacement of the material is larger in a first cross direction, than in a second cross direction, which is approximately 90° rotated, with according soft transitions of the displaced material from the first to the second cross direction.

   – that thereby the wall parts of the second and additional plate sections (21, 22) in the area of the first cross direction, running in deep-drawing direction, are accordingly thinned more, up to tear separation, without the first plate section (19) being thinned or weakened accordingly, so

   – that in the first cross direction a lower thickness of the wall parts remains, with a strong sub-seizing of the plates (15, 16, 17) by the bottom parts of the plate sections (19, 21, 22), and that with accordingly soft transition in the second cross direction a substantially larger thickness of the wall parts remains, with less sub-seizing of the plates (15, 16, 17) by the bottom parts of the plate sections (19, 21, 22).

2. Method according to claim 1, characterized by the fact that the die (1) and the deep-drawing opening (9) exhibit a circular or an oval cross section and that the work area (4, 5, 6) of the die (1) is designed wedge-shaped with a to a large extent rectangular front surface (4), so that at the opposite sides of the die (1) strong thinnings up to tear separation of the wall parts of the second and additional plate sections (21, 22) take place and that the radial displacement is held back by the wedge areas (5).

3. Method according to claim 1 or 2, characterized by the fact that the volume of the deep-drawing opening (9) is constant in the deep-drawing direction (press direction) and transverse to the deep-drawing direction (press direction), so that during the squeezing procedure the longitudinal extension as well as the transverse extension of the deep-drawn plate sections (19, 21, 22) is limited unyieldingly and an edge area, running in deep-drawing direction, results.

4. Method according to claim 1 or 2, characterized by the fact that during the squeezing procedure the volume of the deep-drawing opening (9) can be increased in longitudinal extension and/or transverse extension.

5. Method according to one of the preceding claims, thereby characterized,

   – that during the squeezing procedure existing edges (14) of recesses (13), pointing towards the die, engage at the base (11) of the deep-drawing opening (9) in the bottom of the first plate section (19) and obstruct its radial outward flow and

– that displaced material from the second or above plate section (21, 22) flows into the resulting radial clearances above the first plate section (19).

6. Method according to claim 5, characterized by the fact that the obstruction of the radial outward flows takes place in the first cross direction.

7. Method according to one of the preceding claims, characterized by the fact that the first and third plate (15, 17) consists of metal and that the intermediate plate (16) consists of plastic.

8. Method for connecting plates (15, 16, 17) lying on top of one another by clinching, in particular for the implementation of the method according to one of the preceding claims, with at bottom die (8) placed in a device for creating force, the die exhibiting a deep-drawing opening (9) with an unyielding base (11), and with a die (1), driven toward the bottom die (8) transverse to the to be connected plates (15, 16, 17) whereby at least the bottom part of the first (lowest) plate section (19), seen from the bottom die (8), and the above second and additional plate sections (21, 22) sub-seize their associated plate at least partially, thus characterized
– that the work area (4, 5, 6) of the die (1) and/or its work peg (2) are designed wedge-shaped, with an essentially rectangular front surface (4), running transverse to the deep-drawing direction, whose narrow sides cross themselves with the lateral surface (6) of the work peg (2),
– that between the lateral surface (6) and the face of the front surface (4) two wedge-shaped work areas (5) are present, which are opposing each other diagonally to the deep-drawing direction and are mirror-symmetrically to each other, for a smaller radial material displacement.
– that the distance between the lateral surface (6) of the die (1) and the side walls (10) of the deep-drawing opening (9) prevent cutting the first (lowest) plate section (19) during the deep-drawing and the squeezing procedure both in deep-drawing direction and in cross direction.

9. Method according to claim 5, characterized by the fact that the die (1) above the wedge shape and the deep-drawing opening (9) exhibit a circular or oval cross section.

10. Method according to claim 8 or 9, characterized by the fact that the deep-drawing opening (9) in the bottom die (8) is designed as a blind opening, that its side walls (10) run in deep-drawing direction and are unyielding, like the base (11) of the deep-drawing opening.

11. Method according to claim 10, characterized by the fact that in the boundary area of the base (11) of the deep-drawing opening (9) a circular crease (12) is present, with a cross section that is enlarging in upward direction.

12. Method according to claim 8 or 9, characterized by the fact that the volume in the deep-drawing opening can be increased after the deep-drawing procedure and during the squeezing procedure lengthwise and/or in cross direction.

13. Method according to claim 12, characterized by the fact that the sidewalls of the deep-drawing opening are designed radial flexible.

14. Device according to one of the claims 8 to 13, characterized by the fact that the base, although actually unyielding, can be adjusted a certain stroke length when exceeding a certain pressing force of the die.

15. Device according to one of the claims 8 to 14, characterized by the fact that in the base (11) of the deep-drawing opening (9) recesses (13) are present, with edges (14) towards the base, which fit in the bottom of the first plate section (19) after the deep-drawing procedure and obstruct a radial outward flow of the squeezed material of this plate section (19).

16. Device according to claim 15, characterized by the fact that the recesses are designed as concentric and/or central symmetrical key grooves (13), which are arranged continuously and/or misaligned to each other.

Summary

A method and a device for clinching are proposed, in which the die 1 exhibits a wedge-shaped work area 4, 5, 6, causing different material displacement in two, 90° misaligned, cross directions.

Fig. 1